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Docket No. 8733.120.01

AF
1763

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Woo Sup SHIN, et al.

Group Art Unit: 1763

Serial No.: 09/039,438

Examiner: R. Zervigon

Filed: March 16, 1998

For: ETCHING APPARATUS

REQUEST FOR RECONSIDERATION

BOX AF

Commissioner of Patents
Washington, D.C. 20231

#36NR
2/20/03
mw

Sir:

In response to the Final Office Action mailed November 20, 2002, the following amendments and remarks are respectfully submitted.

REMARKS

At the outset, the Examiner is thanked for the thorough review and consideration of the subject application. The Final Office Action of November 20, 2002 has been received and contents carefully reviewed.

Claims 1-25 are pending in the present application.

The Examiner rejected claims 1, 2, 7, 10, 11, 13, 14, 17-22, and 25 under 35 U.S.C. 35 § 103(a) as being unpatentable over Nelson (U.S. Pat. No. 4,147,581) in view of Chung et al. (U.S. Pat. No. 5,000,795) and Kanda (U.S. Pat. No. 4,338,157), rejected claims 3-6, 8, 9, 12, 15, 23, and 24 under 35 U.S.C. 35 § 103(a) as being unpatentable over Nelson in view of Chung et al. and Kanda and further in view of Jones et al. (U.S. Pat. No. 3,869,313); and rejected claim 16 under 35 U.S.C. 35 § 103(a) as being unpatentable over Nelson in view of Chung et al. and Kanda, and further in view of Tittle (U.S. Pat. No. 4,886,590). The

rejections are traversed and reconsideration of the claims is respectfully requested in view of the following remarks.

The rejection of claims 1, 2, 7, 10, 11, 13, 14, 17-22, and 25 under 35 U.S.C. § 103(a) as being unpatentable over Nelson in view of Chung et al. and Kanda is respectfully traversed and reconsideration is respectfully requested.

Claim 1 is allowable over the cited references in that claim 1 recites a combination of elements including, for example, “a first tank including a first etchant; an etch bath for immersing said glass substrate in said first etchant, ...the etch bath containing a residual etchant including a diluted etchant and residue material after the glass substrate is etched with the first etchant...; a second tank for receiving the residual etchant from the etch bath and separating the diluted etchant from the residue material; a connecting passage connecting the first and second tanks for transferring the separated diluted etchant from the second tank to the first tank...” None of the cited references, including Nelson, Chung et al., or Kanda, singly or in combination, teaches or suggests at least these features of the claimed invention. Accordingly, Applicant respectfully submits that independent claim 1 and claims 2-9 and 19, which depend therefrom are allowable over the cited references.

Claim 10 is allowable over the cited references in that claim 10 recites a combination of elements including, for example, “a control unit for receiving a signal indicating the temperature of the etchant from the temperature sensor and transmitting an etching termination signal to the etch bath when the temperature reaches a target temperature; wherein an etched thickness of the glass substrate is derived from the temperature of the first etchant.” None of the cited references, including Nelson, Chung et al., or Kanda, singly or in

combination, teaches or suggests at least these features of the claimed invention.

Accordingly, Applicant respectfully submits that independent claim 10 and claim 20, which depends therefrom, are allowable over the cited references.

Claim 11 is allowable over the cited references in that claim 11 recites a combination of elements including, for example, “a first tank including a first etchant; an etch bath for immersing said glass substrate in said first etchant, ...the etch bath being connected to the first tank for receiving the first etchant... the etch bath producing a residual etchant including a diluted etchant and residue material as a result of etching the substrate; a separation tank adapted to receive the residual etchant from the etch bath for separating the diluted etchant from the residue material, the separation tank transferring the separated diluted etchant to the first tank; ... wherein an etched thickness of the glass substrate is derived from the temperature of the first etchant.” None of the cited references, including Nelson, Chung et al., or Kanda, singly or in combination, teaches or suggests at least these features of the claimed invention. Accordingly, Applicant respectfully submits that independent claim 11 and claims 12-18 and 25, which depend therefrom are allowable over the cited references.

Claim 21 is allowable over the cited references in that claim 21 recites a combination of elements including, for example, “a first tank including a first etchant; an etch bath for immersing said glass substrate in said first etchant, ...the etch bath being connected to the first tank for receiving the first etchant, the etch bath containing a residual etchant including a diluted etchant and residue material after the glass substrate is etched with the first etchant...; a second tank for receiving the residual etchant from the etch bath for separating the separated diluted etchant from the residue material; a connecting passage connecting the first

and second tanks for transferring the separated diluted etchant from the second tank to the first tank; ...wherein an etched thickness of the glass substrate is derived from the temperature of the first etchant.” None of the cited references, including Nelson, Chung et al., or Kanda, singly or in combination, teaches or suggests at least these features of the claimed invention. Accordingly, Applicant respectfully submits that independent claim 21 is allowable over the cited references.

Claim 22 is allowable over the cited references in that claim 22 recites a combination of elements including, for example, “wherein a reaction heat generated from etching the glass substrate changes the temperature of the etchant; wherein an etched thickness of the glass substrate is derived from the temperature of the first etchant.” None of the cited references, including Nelson, Chung et al., or Kanda, singly or in combination, teaches or suggests at least these features of the claimed invention. Accordingly, Applicant respectfully submits that independent claim 22 is allowable over the cited references.

The Examiner cites Nelson as disclosing “[a]n etched product (‘solid’; column 4, lines 40-50) is covered in unit 2 (Figure 1) with an aqueous liquid (first etchant – ‘etching solution’; column 4, line 43; column 2, lines 45-69)... and the resulting liquid (residual etchant of stream 3, Figure 1; column 4, lines 58-60) is passed through an ion exchanger (11, Figure 1; ‘separation tank’; column 4, line 67–column 5, line 16) to remove the ions from the rinse liquid which is reused or discharged (30, 16; Figure 1). The solids (residue materials) are removed from an etcher (‘etch bath’) (2) via a stream (3) which passes into a rinse chamber (a second tank) (4). (Fig. 1; col. 4, lines 49-68). ...A replenishing solution (30) from the ion exchange means is combined (31) with the stream (22) of a bulk storage tank

(20; 1st Tank; column 5, lines 35-40) to form a combined stream (31) going to the etcher (2; col. 5, lines 35-55)..."

Applicants respectfully direct the Examiner to column 4, lines 36-39 where Nelson teaches "...the solid to be etched and having a surface of etchable material, e.g., a metal, passes via stream 2 into etcher 2...", at column 4, lines 43-45 "...and metal is dissolved from the surface of the solid by etching solution containing an active etchant...", and further at lines 48-62 "[t]he etched solids are removed from the etcher 2 via stream 3 which passes into liquid rinse chamber 4 in which the solids are contacted with a spray or shower of rinse liquid stream 5... in order to wash off and remove entrained etchant solution which is initially present in stream 3 as coating films on the etched solids. ...The spent rinse liquid in unit 4, now containing dissolved cations of the etched material in diluted amount derived from stream 3, collects in the lower portion or sump of unit 4 and passes via streams 7 and 8..." Accordingly, Applicants respectfully submit Nelson fails to disclose at least the aforementioned combination of elements of independent claims 1, 11, and 21 and that Chung et al. and Kanda fail to cure the aforementioned deficiencies of Nelson.

In the "Response to Arguments" section of the Office Action mailed on November 20, 2002, the Examiner stated "[s]tream 31 feeding the etcher and stream 30 from the second tank read on the connecting passage."

Applicants respectfully submit, however, that the "connecting passage" as claimed connects the first and second tanks for transferring the separated diluted etchant from the second tank to the first tank (see, for example, claims 1 and 21). The Examiner cited the rinse chamber 4 of Nelson as reading on the "second tank", as presently claimed by the

Applicants, and cited bulk storage tank 20 of Nelson as reading on “first tank”, as presently claimed by the Applicants. However, if streams 30 and 31 of Nelson are interpreted by the Examiner to be the “connecting passage” presently claimed by the Applicants, it is respectfully submitted that the Examiner’s constructed “connecting passage” is inconsistent with the claimed “connecting passage”. For example, the Examiner’s constructed “connecting passage” does not transfer separated diluted etchant from the rinse chamber 4 to the bulk storage tank 20 as is required by the claimed invention. Rather, Applicants respectfully submit that such construction is suggested only by the claimed invention and to do so would necessitate considerable impermissible hindsight. Accordingly, Applicant respectfully requests the withdrawal of the rejection as a *prima facie* case of obviousness has not been established.

The Examiner further states “[Nelson] and [Chung et al.] do not teach a temperature sensor and control unit” and cites Kanda as teaching, among other things, “... a control unit... for receiving a signal indicating the temperature (T) of the etchant from a temperature sensor... and transmitting an etching termination signal ($P \simeq 0$) to the etch bath when the temperature reaches a target temperature...”

Applicants respectfully submit Kanda teaches at column 9, lines 28-60 “[i]n order to inspect the progress of etching of aluminum vacuum-deposited to the substrate 2, the electric current flowing through the aluminum wire 3 is monitored... When the substrate 2 is placed in the etching tank 2 and the start switch 51 is depressed, the timer 49 is actuated to perform measurement of the etching time, and a signal of the time 49 is input to the processing unit 47...The current produced by etching is converted to a voltage by the resistor 6, amplified by

the amplifier 10, put into the processing unit 47 and compared with the value of the etching current memory circuit 48. When the different between the compared currents is small, the newly measured current value is stored in the etching current memory circuit 48. When the newly measured current value is extremely smaller than the previously measured current value... it is judged that etching arrives at the primary terminal point (point A) illustrated in FIG. 1. ...The temperature of the etching solution 8 is measured by the thermocouple 52 according to the output of the timer 49...” Further, at column 10, lines 39-40, Kanda teaches “[w]henthe value P is close to 0, etching is terminated and the buzzer 50 is actuated.” Accordingly, Applicants respectfully submit Kanda fails to disclose at least the aforementioned combination of elements of independent claims 10 and 22 and that Nelson and Chung et al. to cure the aforementioned deficiencies of Kanda.

The rejection of claims 3-6, 8, 9, 12, 15, 23, and 24 under 35 U.S.C. § 103(a) as being unpatentable over Nelson in view of Chung et al. and Kanda and further in view of Jones et al. is respectfully traversed and reconsideration is respectfully requested.

Claims 3-6, 8, and 9 include all of the limitations of claim 1 as discussed above, and Nelson in view of Chung et al. and Kanda fails to teach or suggest at least the features of independent claim 1 as recited above. Similarly, Jones et al. fails to cure the deficiencies of Nelson in view of Chung et al. and Kanda. Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness regarding claims 3-6, 8, and 9, as above.

Claims 12 and 15 include all of the limitations of claim 11 as discussed above, and Nelson in view of Chung et al. and Kanda fails to teach or suggest at least the features of

independent claim 11 as recited above. Similarly, Jones et al. fails to cure the deficiencies of Nelson in view of Chung et al. and Kanda. Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness regarding claims 12 and 15, as above.

Claim 23 is allowable over the cited references in that claim 23 recites a combination of elements including, for example, “a first tank including a first etchant; an etch bath for immersing the glass substrate in said first etchant, ...the etch bath being connected to the first tank for receiving the first etchant... the etch bath producing a residual etchant including a diluted etchant and residue material as a result of etching the substrate; a separation tank adapted to receive the residual etchant from the etch bath for separating the diluted etchant from the residue material, the separation tank connected to the etch bath via an etchant outlet pipe, the separation tank transferring the separated diluted etchant to the first tank; ... wherein an etched thickness of the glass substrate is derived from the temperature of the first etchant.” None of the cited references, including Nelson, Chung et al., Kanda, or Jones et al., singly or in combination, teaches or suggests at least these features of the claimed invention. Arguments presented above with respect to claims 1, 11, and 21 are similarly applicable with respect to the rejection of claim 23. Accordingly, Applicant respectfully submits that independent claim 23 and claim 24, which depend therefrom are allowable over the cited references.

The rejection of claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Nelson in view of Chung et al. and Kanda and further in view of Tittle is respectfully traversed and reconsideration is respectfully requested.

Claim 16 includes all of the limitations of claim 11 as discussed above, and Nelson in view of Chung et al. and Kanda fails to teach or suggest at least the features of independent claim 11 as recited above. Similarly, Tittle fails to cure the deficiencies of Nelson in view of Chung et al. and Kanda. Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness regarding claim 16, as above.

In view of the foregoing Amendments and Remarks, Applicants respectfully submit that the application is in condition for allowance and early, favorable action is respectfully solicited.

If the Examiner deems that a telephone conference would further the prosecution of this application, the Examiner is invited to call the undersigned attorney at (202) 496-7371. All correspondence should continue to be sent to the below-listed address.

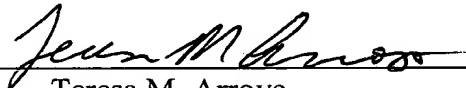
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If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time, or any other fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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